DOCUMENT RESUME

ED 095 462 CG 009 163

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| AUTHOR | Humphreys, Lloyd G.; And Others |
| TITLE | The Sex by Race Interaction in Cognitive Measures. |
| INSTITUTION | Spencer Foundation, Chicago, Ill. |
| PUB DATE | [71] |
| NOTE | 25p. |
| EDRS PRICE | MF-$0.75 HC-$1.85 PLUS POSTAGE |
| DESCRIPTORS | *High School Students; Interaction; Race Influences; *Racial Factors; Research Projects; *Sex Differences; *Social Factors; *Socioeconomic Influences |
| IDENTIFIERS | *Project TALENT |

ABSTRACT

Data consisting of more than 80 cognitive measures from Project TALENT for 100,000 white and black students was analyzed for possible race by sex interactions. Control variables included geographical area, grade in high school, and socioeconomic class. Race-by-sex interactions were largest when socioeconomic class was controlled, and were highly related to the size of the main effect of sex as well. White boys and girls differed more than black boys and girls regardless of whether the overall sex differences favored males or females. Sex-by-grade and, to a lesser extent, sex-by-area interactions were also moderately large and consistent with the size of the sex main effect. Because there were no consistent relationships with other main effects, and because the measures producing sex differences also tended to produce the interactions, it was concluded that sex differences and the interactions with sex share the same causes. Differences between these results and those of Jensen were also discussed. (Author/PC)

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# THE SEX BY RACE INTERACTION IN COGNITIVE MEASURES

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## Introduction

Jensen (1971) has discussed race (black and white) by sex interactions in employment, income, and education. He was also able to find some evidence for this interaction in psychological test scores, both cognitive and noncognitive. He concluded that the sex difference was almost twice as large for blacks as for whites, but he did not try to develop a theory to account for the finding.

There are limitations with respect to the psychological test data analyzed by Jensen. For the most part he was necessarily concerned with standard tests of intelligence. The problem should be investigated over a wider range of cognitive tests than were available to him. The samples used by Jensen were also drawn from widely different populations, and the tests used varied with the population sampled. Thus there is possible confounding between type of cognitive variable and type of population.

The present senior author was a member of one of the original Project TALENT advisory committees and remembered seeing at one of the committee meetings some very incomplete data related to the sex by race interaction that were in the opposite direction from the findings reported by Jensen. On two science information tests black girls were closer to black boys than white girls were to white boys. On both of these tests, in contrast to those used by Jensen, the overall sex difference was large and favored the boys. Thus the sex by race interaction may be quite complex. Since a very large number of cognitive tests, showing overall sex differences varying widely in size as well as sign, were used in Project TALENT, the data bank appeared to be a promising source of information with which to extend Jensen's research.

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## Procedure

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The testing for Project TALENT was done in 1960. At that time in the history of this country it was not possible to obtain information concerning the race of individual students. However, information was obtained concerning the racial mixture in schools, and large numbers of schools were described as 100% white or 100% black. While the students in these schools do not represent random samples of either the white or black population of high school children, it was decided that a main effect bias was not critical to the investigation. The aim of the research was to study the interaction, not the size of either the race or sex difference.

It was decided to request data on all students in the data bank who were in either all white or all black schools. Because these students would necessarily vary in other respects as well, certain control demographic measures were included in addition to sex and race. These were area of the country, which was divided into south and nonsouth, and grade in school, which was dichotomized into 9th and 10th versus 11th and 12th. Socio-economic status (SES) was also considered important, but the necessary restriction on black students that they be in all black schools reduced drastically the number of middle class blacks available. It was decided, in consequence, to split the white group into a lower and an upper group on the socio-economic index developed in TALENT research (see Shaycoft, 1967) with the size of the lower group approximately matching the total number of black students. The latter were not dichotomized on the SES variable.

The N, mean, and standard deviation in each of the 24 groups defined by the experimental and control variables were the basic data obtained from the data bank. Every available cognitive measure, including composites, became the subject of this investigation. Table 1 shows the SES data for the 24 groups and is illustrative of the format of the cognitive data as well.

It is seen that the low SES white group is approximately as large as the black group and that the mean index of the former group is actually a little lower, with a much smaller standard deviation, than in the black group. However, if the white

group were retested on a comparable form of the SES composite, the mean would increase somewhat and the standard deviation would increase substantially. Although matching was not an issue, the two groups are probably about as close to each other in terms of this objective composite as one could obtain by design.

As a substitute for the incomplete factorial design, it was decided to obtain four analyses of the basic data as follows:

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Analysis I: blacks vs. low whites (the racial comparison)

Analysis II: blacks vs. both white groups (race and SES confounded)

Analysis III: blacks plus low whites vs. high whites (a different confounding of race and SES)

Analysis IV: low whites vs. high whites (the SES comparison)

As a substitute for the lack of orthogonality in the analyses, some form of regression analysis was required. Since no independent variable furnished more than two levels, it was possible to work with simple product-moment correlations for the relationships among variables and interactions. Before proceeding with the correlational analysis, however, it was necessary to transform the measures. Casual inspection revealed that there was an extreme degree of heterogeneity of variance for many of the measures from subgroup to subgroup in each of the four analyses and that this heterogeneity was systematic, i. e., means and standard deviations were highly correlated. Systematic heterogeneity, with some measures showing standard deviations of standard deviations that were one-third the size of the standard deviation of the individual scores could produce spurious interactions.

While it might be argued that the differences in standard deviations reflected real differences in the variability of the abilities measured by the tests from one group to another, a more parsimonious explanation is that the heterogeneity of variance, particularly when it is systematic, is due to the nature of the psychological test. It is exceedingly hazardous to assume that any psychological test composed of pass-fail items produces an equal interval scale. This assumption is especially hazardous for short tests such as those used in the TALENT research. Standard

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deviations are likely to be large around means from the center of the distribution of item difficulties and to be low when means approach either the floor or the ceiling of the test.

Although the amount of heterogeneity of variance in the raw scores was frequently substantial, the size of the correlations between means and standard deviations for the various combinations of subgroups also tended to be quite substantial. Median correlations, without regard to sign, varied from .81 to .83, depending on the particular combination of subgroups. If, in general, variables showing a large degree of heterogeneity were also those that exhibited high systematic relationships between means and standard deviations, an appropriate transformation would produce essentially homogeneous variances.

The transformation of means and standard deviations (Lewis, 1973) used on all cognitive measures was as follows: for measures having a positive correlation between mean and S.D., $\bar{y}_i = \frac{1}{b} \log_e (a + b \bar{x}_i)$ while for those having a negative correlation, $\bar{y}_i = \frac{1}{b} \log_e ( a + b (300 - \bar{x}_i))$. An approximation to the variance of y, equal to unity, was used for each subgroup in each analysis. The accuracy of the assumption that the subgroup variances had been equated by the transformation was checked by obtaining ratios of the standard error of estimate of standard deviations predicted from means to the standard deviation of individual scores. The median ratio varied from .05 to .06, depending on which set of subgroups was involved; it was decided to retain for analysis all measures having ratios of .11 or less. Three measures were excluded from analyses I, II, and III while only one was excluded from Analysis IV. All exclusions were highly speeded measures of clerical "aptitude" which probably contain a good deal of motivational variance.

Coding of demographic variables for correlational purposes is necessary though arbitrary. The coding of the main effects completely determines signs of the products from which the interactions are obtained. The coding used follows:

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Race (SES): blacks, blacks plus low SES whites, or low SES whites +1
contrast groups -1

Sex: males +1 females -1

Area: south +1 nonsouth -1

Grade: 11th and 12th +1 9th and 10th -1

An interaction correlation between race and sex will be positive if the weighted mean of male blacks and female whites exceeds the weighted mean of female blacks and male whites. Its interpretation, however, depends on the direction of the differences for the main effects. The race (SES) variable produces differences that are almost 100% negative (exceptions are a small number of attempt scores on speeded clerical tests that met the criterion for inclusion) while almost half of the sex differences are positive and half negative. A positive interaction correlation when race (SES) is negative and sex positive indicates that the sex difference for blacks is the larger, while that same positive interaction correlation when race (SES) is negative and sex negative indicates that the sex difference for whites is larger. A negative interaction correlation in the same main effect combinations means that the relative sizes of the sex differences are reversed.

Intercorrelations of 16 variables each were obtained for 76, 76, 76, and 78 dependent variables in the four major analyses. The first 15 variables were the 4 independent variables, the 6 first order interactions, the 4 second order interactions, and the one third order interaction with the 16th variable being each of the dependent variables in turn. Because the design was not orthogonal, the intercorrelations of the independent variables and their interactions are nonzero. Thus, the next step involved the computation of partial correlations between each of the first 15 variables with a particular dependent variable while holding constant the remaining 14. This step follows the logic of Method 1 of Overall and Spiegel (1969). An alternative would have been to compute partials in a step-wise procedure (Overall and Spiegel's method 2), but it seemed better in these data to treat products as equal in importance to main effects rather than as residuals.

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## Results

Table 2 presents means and standard deviations of the partial product-moment correlations computed over the number of variables used in each of the analyses. Before attempting to interpret these data, however, certain of their characteristics must be described. The observations used in these computations are independent of each other from row to row because the correlations were partials. The individual observations that enter a given mean or standard deviation, however, are not independent of each other. With few exceptions the intercorrelations of the tests are positive and many of these correlations are quite high. Thus, there is a great deal of redundancy in the information furnished by the 76 to 78 measures. There are also some difficulties associated with the measurement scale, which is now in correlational units. These difficulties have nothing to do with the appropriateness of the transformation used on test raw scores. There is restriction of range of talent in analyses I and IV; thus the units of measurement are not equal to each other from column to column. Neither are the units of measurement equal to each other from row to row because product-moment correlations are attenuated as dichotomies depart from 50/50 splits. This effect, in turn, varies from column to column for a given row as well. Correlations are also a function of the reliability of the variables. In these data the reliabilities of the dependent variables show considerable variation in size. Modal reliabilities are only moderately large because tests were, of necessity, fairly short in length. These defects in scale are not sufficiently large, however, to preclude making the most interesting and relevant comparisons.

The standard deviations in Table 1 are of primary interest because these reflect the different sizes of correlations between the independent variables, their interactions, and the several dependent variables. It is here, for example, that the hypothesis of race by sex interactions can be tested. The size of this interaction for any given dependent variable is independent of all main effects and of all other interactions. The tests used as dependent variables, as noted above, are not independent of each other so that the usual sampling error formulas for differences in means or in variability cannot be applied. A single partial, however, can be interpreted

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relative to the standard error of the z-equivalent of r. For the smallest sample (Analysis I) the standard error of z is less than .006 and for the other columns only a little larger than .003. It is clear that there are many interactions that are highly significant statistically.

The means of all interactions tend to be quite close to zero. Thus when the standard deviation is large enough to place large numbers of correlations in the area of statistical significance, there are both positive and negative interactions of a size needing explanation. The key entries in Table 2 for the race by sex interaction hypothesis are the standard deviations in the 5th row. These standard deviations are the largest, except for main effects, in each of the four analyses. Sex thus interacts more strongly with either race or SES or both than with other variables and more strongly than the other variables interact with each other. Comparison of this standard deviation across the 5th row also allows for a determination of the relative importance of race and SES. The standard deviation for the contrast between races with SES controlled (Study I) is the largest of the four while that for the opposite contrast (Study IV) is the smallest. The primary interaction, therefore, appears to be between race and sex.

Though there is no question concerning the sampling stability of interactions as small as .02, it is equally clear that few if any are large enough to have much practical significance. The range of correlations for which the standard deviation in row 5, column I, is .044 is approximately from -.10 to -.15. Small correlations, however, may have theoretical importance.

The race (SES) by area interaction (row 6) tends to have the second largest standard deviation of all interactions. Reading from left to right across the 6th row, also, it is clear that the interaction with area involves race primarily rather than SES. Several other interactions have correlations with dependent variables that may have some theoretical interest, but even the largest of these is quite small.

Main effects were not the objectives of this study, but some of them are of interest. Again, perhaps, the spread of correlations is of greater interest than the

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means. For the race (SES) variable the means are the largest but are somewhat inflated as a function of the selection of the sample. The standard deviations indicate a large degree of variability, with mechanical measures showing the largest differences between whites and blacks and the previously mentioned attempt scores on highly speeded clerical tests showing small differences in favor of blacks.

For the SES contrast involving whites only both the mean and the standard deviation are smaller than for the race comparison. Mechanical measures have a difference that is lower than the mean with verbal, feminine tests producing the largest differences. There are near zero differences in information about hunting and fishing.

Grade or age within the high school range does not produce differences as large as those associated with race or SES, but the distributions are otherwise similar. Standard deviations are quite large with a spread of differences extending from clerical information at the high end to physics information at the low end. The latter difference is approximately zero.

The overall sex difference favors males, but the mean is quite close to zero. There are almost an equal number of differences in each direction. Standard deviations are, for this main effect, the largest of all. The range is defined by mechanical measures on one end and by home economics information on the other.

Area means show that the South is generally lower on cognitive variables than the rest of the country, but these means are smaller than for grade or age while the standard deviations are about equal in size. On some variables boys and girls in the South are superior, but these represent a mixed bag. Information about farming, the Bible, hunting and fishing show southern superiority while the more feminine information tests show the largest differences in the other direction.

To test Jensen's conclusion that black sex differences are about twice the size of white differences, it is necessary to use some statistic other than the standard deviation of interactions. In the present data, consisting of almost 80 cognitive variables, directional trends can be described most clearly by relating sizes of main effects to sizes of interactions. The first step involved making the actual

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plots, but when it was observed that a straight line did little if any violence to the relationships portrayed, complete tables of product-moment intercorrelations were computed among the main effects and their interactions. The individual observations were, of course, the almost 80 partial correlations for each variable and interaction.

Table 3 presents intercorrelations of the only variables in each of the 4 studies that show moderately high to high relationships with each other and which also show consistency from study to study. These 4 variables are the main effect of sex and each of its 3 first order interactions. These correlations can be translated into differences between differences in means for easier interpretation. In every case in which the interaction is nontrivial, white boys and girls differ from each other more than do black boys and girls. This finding is independent of the direction of the sex difference. The size of interactions represented by correlations of .05 to .10 is at the same level reported by Jensen, i. e., from .1 to .2 standard deviation units, but the differences are in the reverse direction.

These same interactions can also be interpreted as differences between race differences for the two sexes. When the sex difference favors males, black girls are more similar to white girls than black boys to white boys. When the sex difference favors females, on the other hand, black girls differ more from white girls than black boys do from white boys.

Similar statements can be made concerning the relationship between sex and the sex by grade interaction. Advanced high school students differ more from each other as a function of their sex than do beginning high school students. This trend, as indicated by the high correlation between the two variables, is again highly consistent for nontrivial sex differences.

For the area by sex interaction, which is considerably smaller than the other two, the trend is not quite as consistent, but there is at least some tendency for northern boys and girls to differ from each other more than southern.

The correlations in Table 3 also show that there is a substantial tendency for

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variables producing a large race by sex interaction to also produce a large sex by grade interaction. The sex by area interaction variables also overlap with the other two though to a more limited extent.

It can be concluded that sex role differentiation in cognitive variables is more pronounced in whites, advanced high school students, and northern students than in their counterparts. Since the same variables tend to be involved in these interactions, it is reasonable to assume common causes for the phenomena.

The preceding conclusion is reinforced by the correlations presented in Table 4. The table contains correlations of each of the other main effects involved in a particular interaction with that interaction. These are all essentially zero and differ markedly from the correlations between the sex main effect and the same interactions that appeared in Table 3.

Even though the correlations with other main effects are quite small, it was hypothesized that the independent variables in combination might be more highly correlated with the several interactions than the main effect of sex. Sizeable beta weights for variables other than sex would suggest additional causal sources for the interactions. These multiples are presented in Table 5. When they are compared with the zero order correlations in Table 3, it appears that causal factors are associated with sex alone. The only possible exceptions occur in Analysis IV which did not involve race.

The race by area interaction is next in size to the race by sex interaction. For reasons of history and social organization, it is also of interest in its own right. Table 6 presents zero order and multiple correlations of the main effects with this interaction. The latter are of an intriguing size, but the variations in size and sign of the zero order correlations from one analysis to another make interpretations hazardous. These main effects are seemingly not tapping the causes of the area by race interaction. This also implies that the factors responsible for this interaction are not those that produce race differences.

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One other correlational finding should be mentioned. There is a correlation of -.83 between the main effect of sex and the second order interaction of race (SES), sex, and area in Analysis III. While there is some communality in pattern of relationships involving this interaction in the 4 analyses, with the main effect of sex being most important in all 4, the size of this interaction is generally so small that correlations with other variables are necessarily low. In Analysis III, however, which has the most complex race (SES) independent variable, this interaction is larger. The variables that produce it also tend strongly to be the ones involved in the other interactions with the sex main effect as well. Although difficult to interpret, it does reinforce the conclusion that, for these data, the sex variable and the causes of sex differences are the most important.

## Discussion

Before discussing the social and psychological significance of these findings, a second look should be given the methodology. Since interactions can be produced by differences in units of measurement in different regions of the scale, a critic might ask if the transformation had produced the interactions. This can be answered unequivocally. Since the great majority of the correlations between means and standard deviations were positive, most of the interactions would have been larger and in the same direction if the transformation had not been used.

The above raises a possible question concerning the adequacy of the transformation. Might there have been residual inequality that produced the interactions observed? This seems unlikely for two reasons. In the first place, as noted earlier, there is relatively little residual variability in size of standard deviations. Secondly, the main effect of race is large with subgroup means widely scattered throughout the range of scores, but the size of interactions is not related to the size of the main effect of race. Interactions are related consistently to the size of the main effect of sex and to no other.

Would Jensen's results have been replicated had the transformation not been used? As reported above, a very small number of measures showed large negative correlations

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between means and standard deviations. Sex differences for blacks might have been larger than sex differences for whites on some of these measures, but for the most part the discrepancy between the present results and Jensen's findings would have been increased if the analysis had been done on the original units.

A final potential criticism must be considered. If differences in units of measurement can produce interactions, the use of an appropriate transformation will lead to zero interaction. Developing transformations to accomplish this, however, does not lead to anything useful psychologically in the present instance. The transformation would have to be tailored independently for each Project TALENT variable. Furthermore, since there are interactions in two directions as a function of the sign of the sex difference, the nature of the transformation would have to differ in both degree and direction for the several variables. Different transformations would also have to be applied to the same variable to abolish each of the several interactions involving sex. Finally, such transformations would reduce the size of sex differences overall which is, psychologically, what the research is all about.

The preceding discussion suggests that the interactions are real, not spurious. Even the largest, the race by sex, is not, however, very large. Because the number of observations is large, the majority of the interactions are highly dependable from the sampling point of view, but they do not contribute very much in the way of explanatory variance. Translating correlations into differences between differences in standard score units, as was done earlier, a .3 difference is about the maximum observed. On tests in the mechanical area, for example, a somewhat larger number of black girls will be above the white male mean than one would expect on the basis of knowledge of sex alone. This is the largest effect of any occupational importance observed in the data. By and large, the results are of greater interest theoretically than practically.

Since there is a great deal of communality among the variables that show large main effects of sex and large interactions involving sex, it was suggested earlier that there were common causes as well. Causes for sex differences, of course, can

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be either genetic or environmental or both. It seems more than a little improbable that there could be innate abilities to acquire mechanical information, on the one hand, or domestic service information, on the other, but the possibility of innate temperamental differences cannot be discarded. There seems to be an innate difference in grooming behavior in primates other than man and a difference in the other direction in activity level and aggressivity. A cause and effect route from temperament through interests to information is not unreasonable.

From this point of view, increasing differences during high school, corresponding to ages 15 to 18, would not be unexpected. Would we infer from this, however, that blacks mature earlier, with sex role differentiation stopping sooner? Does maturation proceed for a somewhat longer period of time in the North than in the rest of the country? With only one part of the complex of relationships somewhat plausible, it seems reasonable to dismiss this line of explanation.

An environmental explanation starts with the observation that most measures which show masculine superiority are occupationally oriented while most variables showing feminine superiority are culturally oriented. Since a higher proportion of married black women are in the labor force, and since a higher proportion of black families are headed by a lone woman, it seems reasonable that the overall sex role stereotypes would be approximated somewhat more closely in white than in black populations. Since the interaction is largest in the comparison with the lower white SES group, the explanation thus far is probably inadequate. Something else is undoubtedly involved. Remnants of old matriarchal and patriarchal social patterns in black and lower SES white groups, respectively, are possibilities.

As students progress through high school, social expectations of work for boys and marriage and motherhood for girls become more pressing. This was certainly true in 1960 when the data were gathered and is probably still largely true in spite of the greater visibility of other attitudes. It should also be noted that the near zero correlation between the main effect of grade and the sex by grade interaction suggests that the causes of the interaction are extracurricular. The schools do not produce it.

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There is ambiguity concerning the environmental interpretation of the sex by area interaction. Stereotypes concerning southern sex roles are in conflict with these data. As noted above, also, it is doubtful that differences between the quality and quantity of the academic programs of northern and southern schools can be invoked. Perhaps the southern stereotypes are reasonably accurate only for a small proportion of upper class southerners. Although this particular interaction is somewhat peripheral to the rest in its correlational pattern with more exceptions to the general trend, it is clearly necessary to look beyond the stereotype for an explanation. A potentially relevant variable is the urban-rural location of the high schools in this sample. It is probable that rural schools are more heavily represented in the South and that sex role expectations are stronger in urban environments.

The environmental explanation advanced does lead to some predictable consequences. As sex role expectations change, interactions involving sex should also change. The South, for example, is becoming more like the rest of the country in its social patterns. The urban-rural dimension should also be investigated. An interaction with sex might give more consistent results than the sex by area interaction and, in the partial correlational sense, explain the latter. Such a result would seemingly be quite difficult to integrate with a genetic explanation for the sex main effect and its other interactions. Also, if the measurement problems could be solved, an extension of the age range downward into the grades should lead to larger sex by grade (age) interactions. Positive results here, however, could be explained on either genetic or environmental grounds.

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The discrepancy between present results and those of Jensen can be investigated further by looking at the data for some of the Project TALENT composites. Jensen depended heavily on the results from intelligence tests. The strong systematic trends in present data over almost 80 very heterogeneous tests may not hold for composites most like standard intelligence tests. To check this possibility the correlations in Table 7 were extracted from those of the remaining variables.

Jensen's test data generally showed female superiority and larger black differences than white differences. Of the 4 Project TALENT composites, one shows a near zero sex difference, two show female superiority, and two show male superiority. To be consistent with trends in the rest of these data, negative correlations for sex should be accompanied by positive correlations for the interaction. To be consistent with Jensen's conclusions, the interaction correlations for the same two variables should be negative. Six out of 8 interaction correlations are seen to be congruent with Jensen's conclusions, but the size of these correlations is so much smaller than those found by Jensen that they should be considered essentially zero. Composites showing male superiority, on the other hand, clearly follow the trends established in the full set of variables.

The only way in which these near zero interactions could become sufficiently large to be congruent with Jensen's findings would be to use raw scores on scales for which the correlation between means and standard deviations was negative. The Verbal composite had this characteristic, but this negative relationship is rare in present data and not found at all in standard intelligence tests.

One must resort to sampling differences as the most probable source of the discrepancy in findings, but sampling differences can not readily be described. Most of the data surveyed by Jensen were obtained in ad hoc samples. Present data are from a probability sample of schools, but with integrated schools excluded. It seems reasonable that this selection essential to the study affected means of main effects only and did not produce interactions, but this remains an assumption.

In spite of the differences in the outcomes, the occupational conclusion that

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Jensen drew is still partially supported. To the extent that present masculine tests are occupationally valid, and there is every reason to accept their validity, black women are able to compete more successfully with white women in the most masculine occupations than black men are with white men.

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## Footnotes

1 This research was supported by a grant from the Spencer Foundation. The authors wish to thank the Foundation for its support. Reqvests for reprints should be addressed to the senior author.

2 In several of the data sets, partial correlations were also computed, as a matter of interest, in accordance with Method 2 of Overall and Spiegel. Main effects tended to be slightly larger, as would be expected, but in no case was the difference greater than .05 and this only when the Method 1 partial r was already quite large. Differences between the two methods are potentially much greater than this, but instances do not occur with this set of independent and dependent variables. One way of describing the present results is that the main effects are psychologically primary. Treating interactions either as residuals or as coordinate variables statistically had no appreciable effect on the results.

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Table 1

Definition of Subgroups and Sample Statistics

for the Socio-Economic Status Composite

| | | | Blacks | Low SES Whites | High SES Whites |
|---|---|---|---|---|---|
| | South | N | 3137 | 2814 | 5588 |
| | | $\bar{X}$ | 88.21 | 81.97 | 99.73 |
| | | $S_x$ | 10.24 | 4.76 | 7.62 |
| | Male Non South | N | 928 | 2371 | 12535 |
| | | $\bar{X}$ | 90.40 | 83.35 | 100.86 |
| | | $S_x$ | 9.62 | 4.34 | 7.61 |
| Grades 9 and 10 | South | N | 3935 | 2872 | 4946 |
| | | $\bar{X}$ | 87.13 | 82.06 | 98.93 |
| | | $S_x$ | 9.71 | 4.70 | 7.27 |
| | Female Non South | N | 1184 | 2204 | 11987 |
| | | $\bar{X}$ | 90.13 | 83.63 | 100.81 |
| | | $S_x$ | 9.31 | 4.14 | 7.31 |
| | South | N | 2253 | 1817 | 5019 |
| | | $\bar{X}$ | 87.6 | 82.55 | 100.61 |
| | | $S_x$ | 9.64 | 4.43 | 8.04 |
| | Male Non South | N | 648 | 1618 | 11358 |
| | | $\bar{X}$ | 90.62 | 83.88 | 101.34 |
| | | $S_x$ | 9.48 | 3.89 | 7.47 |
| Grades 11 and 12 | South | N | 2924 | 2019 | 4841 |
| | | $\bar{X}$ | 88.09 | 82.60 | 99.49 |
| | | $S_x$ | 9.75 | 4.36 | 7.23 |
| | Female Non South | N | 867 | 1560 | 11426 |
| | | $\bar{X}$ | 9227 | 84.28 | 101.25 |
| | | $S_x$ | 8.92 | 3.60 | 7.32 |
| | Totals | N | 15876 | 17275 | 67700 |
| | | $\bar{X}$ | 88.43 | 82.91 | 100.65 |
| | | $S_x$ | 9.83 | 4.43 | 7.50 |

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Table 2

Means and Standard Deviations of Partial Correlations

| Variable | Means | | | | Standard Deviations | | | |
|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | I | II | III | IV |
| Race (SES) | -.274 | -.281 | -.290 | -.182 | .139 | .117 | .112 | .082 |
| Sex | .018 | .020 | .037 | .033 | .161 | .114 | .179 | .202 |
| Area | -.083 | -.076 | -.124 | -.086 | .057 | .043 | .069 | .067 |
| Grade | .145 | .102 | .146 | .157 | .067 | .043 | .063 | .071 |
| R x S | -.007 | -.012 | -.009 | -.011 | .044 | .035 | .030 | .017 |
| R x A | -.013 | .011 | -.024 | .018 | .031 | .023 | .021 | .010 |
| R x G | -.012 | -.012 | -.007 | -.002 | .021 | .015 | .014 | .012 |
| S x A | .005 | .003 | .005 | .012 | .014 | .009 | .013 | .011 |
| S x G | .013 | .013 | .020 | .021 | .020 | .014 | .021 | .024 |
| A x G | .003 | .005 | .003 | .004 | .012 | .009 | .011 | .011 |
| R x S x A | -.009 | -.006 | -.005 | .001 | .008 | .007 | .011 | .006 |
| R x S x G | .000 | -.005 | -.008 | .009 | .009 | .007 | .007 | .006 |
| R x A x G | .003 | .000 | -.005 | -.004 | .008 | .005 | .005 | .004 |
| S x A x G | .004 | .003 | .006 | .008 | .005 | .004 | .004 | .005 |
| R x S x A xG | -.003 | -.002 | -.003 | -.001 | .005 | .003 | .003 | .004 |

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Table 3

Intercorrelations of the Main Effect of Sex with

Each of its First Order Interactions

| | | I | | | II | | | III | | | IV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 5 | 8 | 9 | 5 | 8 | 9 | 5 | 8 | 9 | 5 | 8 | 9 |
| Sex | 2 | -77 | -51 | 76 | -79 | -45 | 74 | -78 | -68 | 69 | -52 | -32 | 67 |
| R x S | 5 | | 27 | -73 | | 31 | -75 | | 70 | -75 | | 44 | -68 |
| S x A | 8 | | | -50 | | | -48 | | | -64 | | | -38 |
| S x G | 9 | | | | | | | | | | | | |

Table 4

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Correlations of the Other Independent Variables

With the Interaction of Each with Sex

| | Interaction with Sex | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Race (SES) | 26 | 20 | 06 | 22 |
| Area | 09 | 11 | 04 | -15 |
| Grade | -12 | -07 | -08 | -12 |

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Table 5

Multiple Correlations Between the Four Independent Variables as Predictors and Each of the Three Interactions with Sex as Criteria

| | I | II | III | IV |
|---|---|---|---|---|
| Race (SES) by Sex | 81 | 82 | 80 | 59 |
| Sex by Area | 54 | 49 | 70 | 45 |
| Sex by Grade | 79 | 77 | 76 | 73 |

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Table 6

Zero Order and Multiple Correlations with

Race by Area Interactions

| | Race by Area Interactions | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Race (SES) | -18 | -39 | 45 | -40 |
| Sex | 41 | 30 | -14 | -22 |
| Area | 07 | -19 | 25 | -32 |
| Grade | -18 | 06 | -39 | 42 |
| Multiple r | 48 | 48 | 55 | 52 |

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Table 7

Correlations of Project TALENT Composites with Sex and the Race by Sex Interaction in the Four Analyses

| Project TALENT Composites | Analysis | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | I | | II | | III | | IV | |
| | S | RxS | S | RxS | S | RxS | S | RxS |
| "I. Q." | -011 | 012 | 000 | 001 | 000 | 002 | -013 | -011 |
| Academic | -096 | -002 | -046 | -017 | -054 | -016 | -065 | -026 |
| Verbal | -151 | 011 | -090 | -001 | -124 | 001 | -147 | -015 |
| Quantitative | 061 | -018 | 054 | -025 | 097 | -024 | 102 | -023 |
| Technical | 396 | -086 | 291 | -072 | 440 | -056 | 489 | -026 |